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A multi-processor computer system has been developed at the Naval Oceanographic and Atmospheric Research Laboratory (NOARL) to provide databases of scanned aeronautical charts, digital terrain elevations, and cultural feature data for use in Digital Moving Map Systems installed onboard naval aircraft. This computer system is known as the Map Data Formatting Facility (MDFF), and is based on a VAX 8800/8250, three VAXstation 3200s, and two MicroVAX-II systems configured in a mixed interconnect cluster. The MDFF transforms scanned map and chart images into a format suitable for field use by various naval aircraft. The MDFF is distributing the image data to the Navy as a library of Compact Disk-Read Only Memory (CDROM) media. The image library will eventually replace pilots' conventional paper charts; it will also be used for pre-flight simulations and mission planning.

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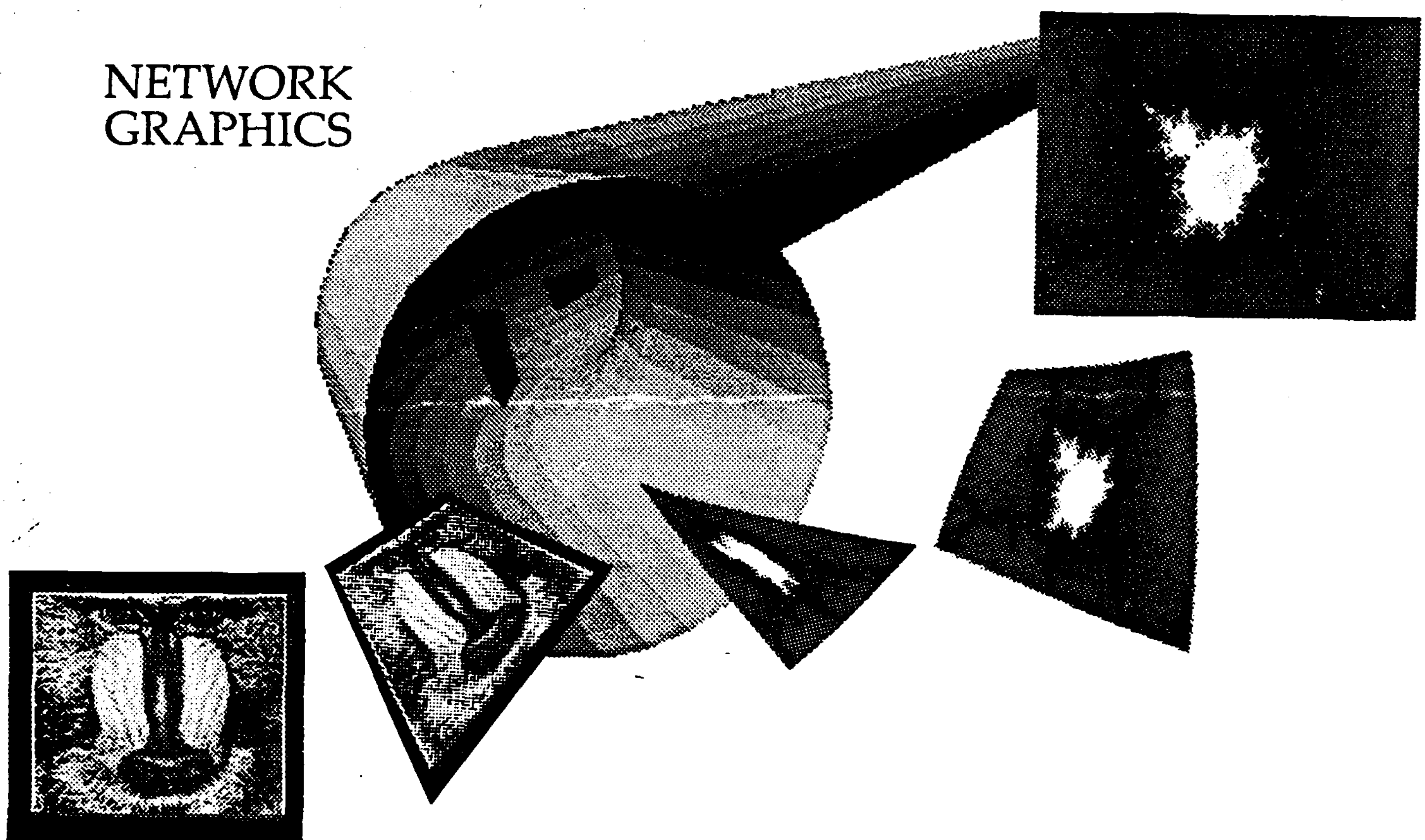

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NOARL's Map Data Formatting Facility

Maura Lohrenz, Perry Wischow
Naval Oceanographic and Atmospheric
Research Laboratory

Tuesday, May 8, 1990
2:00 PM

NOARL's MAP DATA FORMATTING FACILITY

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Naval Oceanographic and Atmospheric Research Laboratory
Stennis Space Center, MS

SESSION NOTES

A multi-processor computer system has been developed at the Naval Oceanographic and Atmospheric Research Laboratory (NOARL) to provide databases of scanned aeronautical charts, digital terrain elevations, and cultural feature data for use in Digital Moving Map Systems installed onboard naval aircraft. This computer system is known as the Map Data Formatting Facility (MDFF), and is based on a VAX 8800/8250, three VAXstation 3200s, and two MicroVAX-II systems configured in a mixed interconnect cluster. The MDFF transforms scanned map and chart images into a format suitable for field use by various naval aircraft. The MDFF is distributing the image data to the Navy as a library of Compact Disk-Read Only Memory (CDROM) media. The image library will eventually replace pilots' conventional paper charts; it will also be used for pre-flight simulations and mission planning.

This presentation will describe the configuration of the MDFF computer systems and give an overview of the projection transformation and image compression being performed on the scanned chart data. The most significant viewgraphs to be shown are attached and are briefly described below.

1. Configuration of Ground Support Station (GSS).
   The GSS was the prototype configuration for the MDFF. While the GSS was used successfully to prepare optical disks for test flights of the AV-8B, it was not suitable for operational use. Production time and the level of user-computer interaction needed to be reduced, and the quality of the scanned map images needed improvement. NOARL's MDFF was developed to address these needs. After completion of the Digital Moving Map System (DMS) proof-of-concept flight tests, the GSS hardware and software were incorporated into the MDFF.

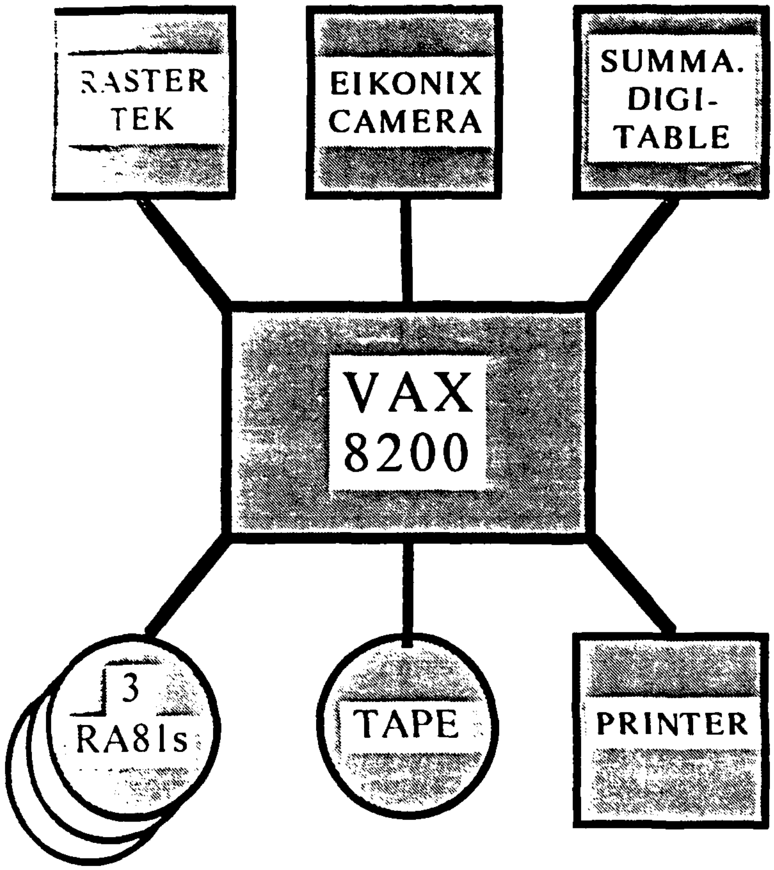
2. Data Flow Through the System.
   Due to the large quantity of data to be processed, the configuration of the MDFF computer system has been designed to perform the various image data processing functions as efficiently and reliably as possible.

3. Ethernet Configuration of the MDFF.
   The MDFF system components are configured as a VAX CI cluster and a Local Area VAX Cluster (LAVC), which are connected to an external, NOARL-wide, computer network. The MDFF has access to all other NOARL computers and various external Ethernet systems, such as the Space and Physics Analysis Network (SPAN), Bitnet, and Arpanet.

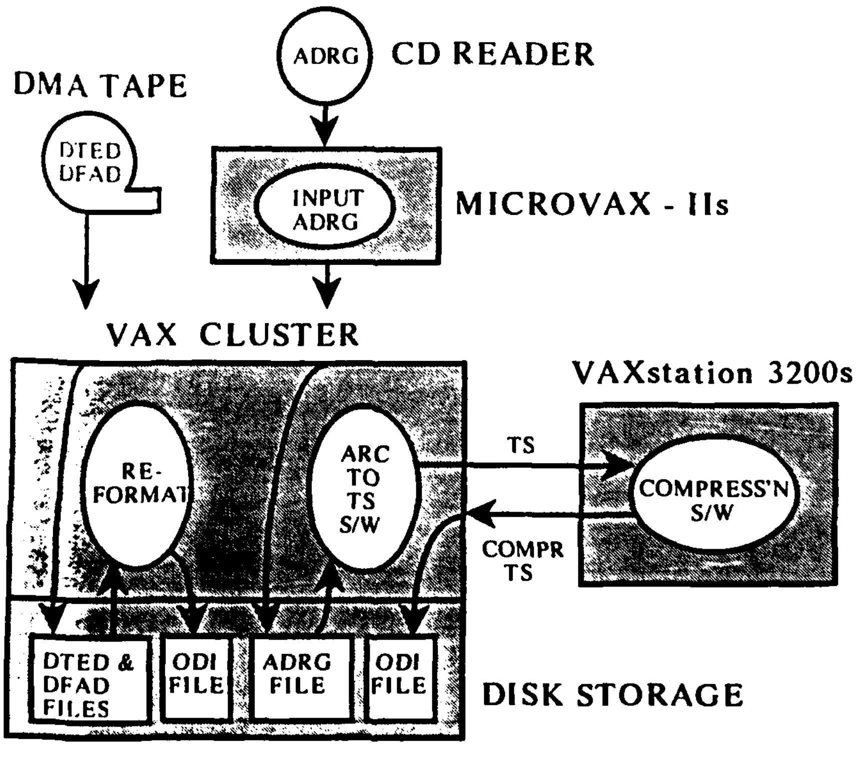
4. Tessellated Spheroid-Model IV (TS-4).
   The scanned chart data is transformed from an internal DMA map projection to the TS-4 projection. A 4:1 data compression and change in map resolution accompanies this transformation. This viewgraph illustrates the layout of the TS-4 grid over the globe. Details on the new map projection will be discussed in the presentation.

5. Color Compression Method.
Color compression of the image data replaces 3 bytes of color data per pixel (1 byte each of RGB) with a single 1-byte color code, thereby compressing the image data by a factor of 3. A color table is generated for decompression and display. More details on this compression process will be given in the presentation.

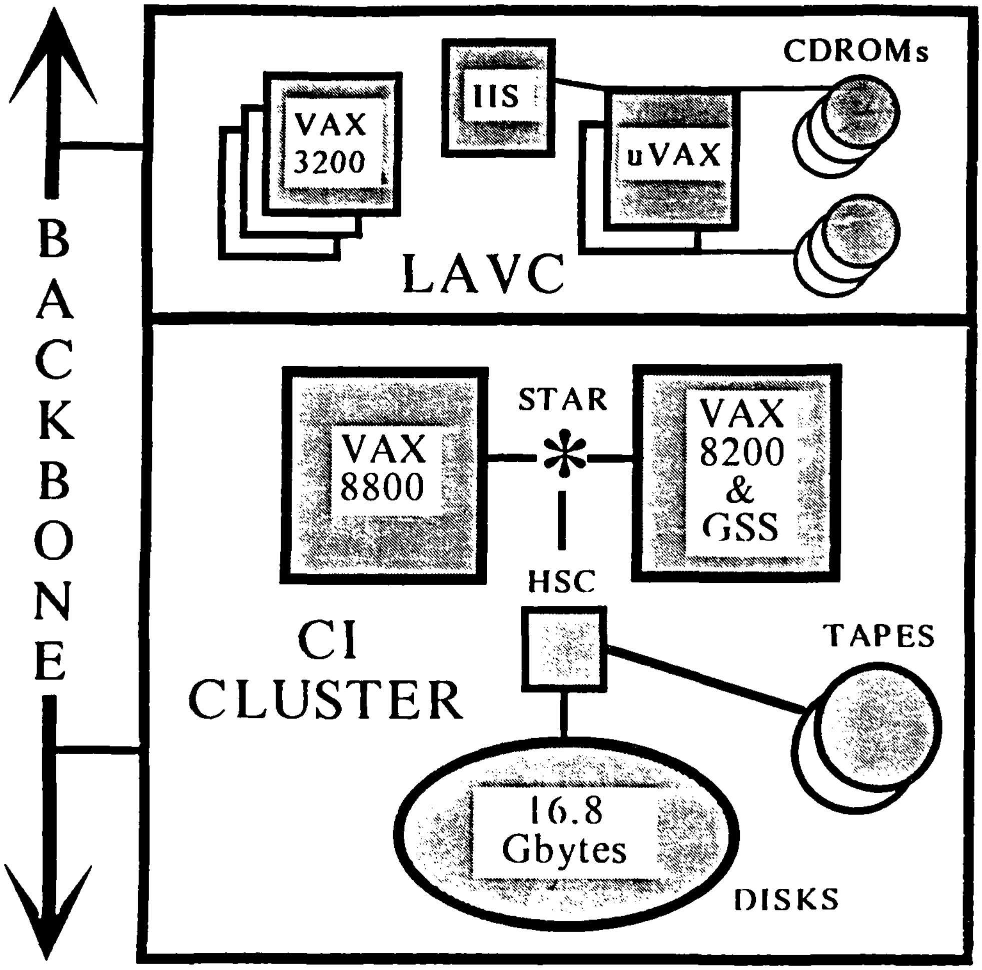
6. Spatial Compression Method.
Following the color compression, a spatial compression process generates a codebook for every 2x2 pixels of map data. The spatial compression codebook reclassifies the image data using an average of 2 bits per pixel. A decompression codebook is also generated to convert the compressed pixel data back to the original image. The number of bits of information per pixel is decreased by a factor of 4 in this step. The change in image quality is noticeable, but not significant.



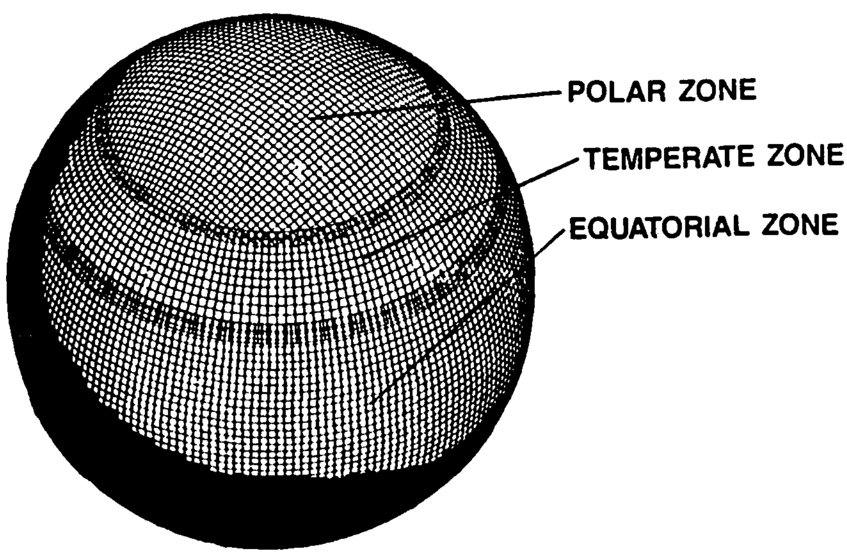
1. Configuration of Ground Support Station



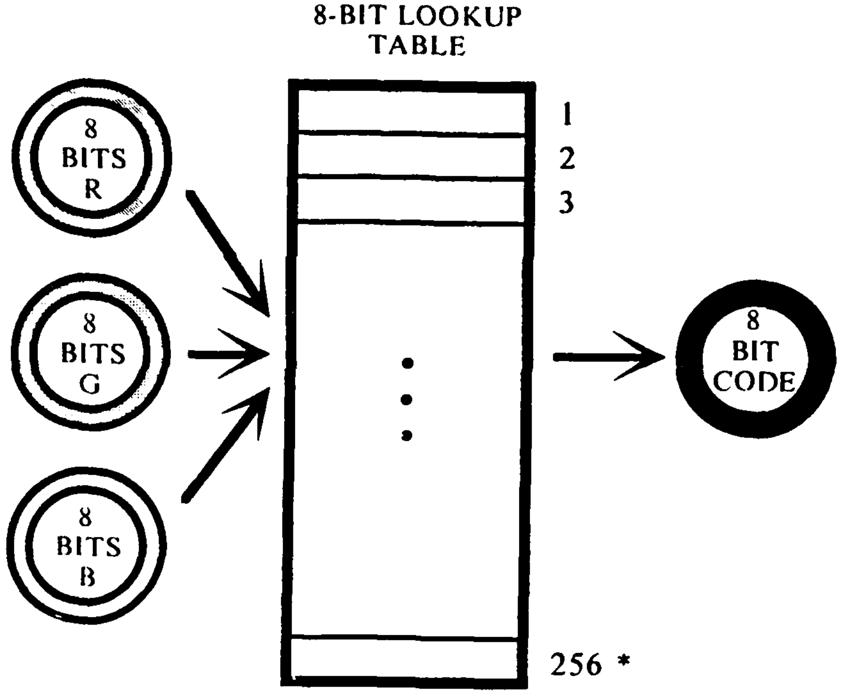
2. Data Flow Through the MDFF



3. Ethernet Configuration of the MDFF

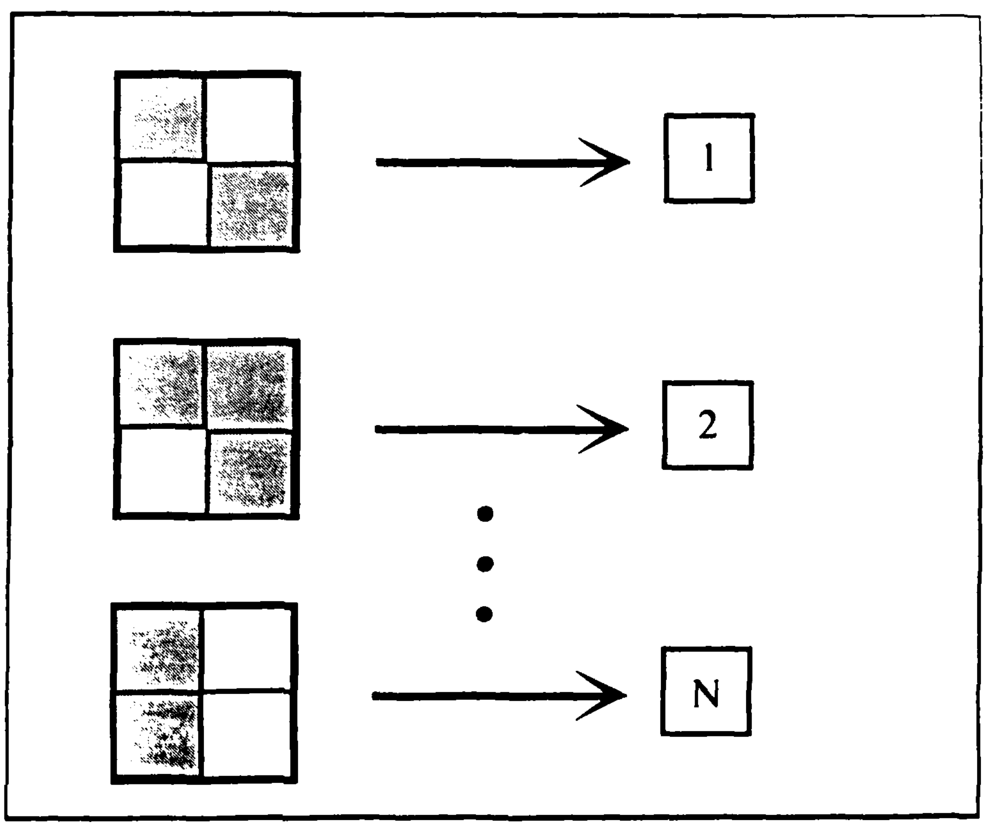


4. Tessellated Spheroid-Model IV (TS-4)



* 240 colors for chart data + 16 for graphic overlays

5. Color Compression Method



6. Spatial Compression Method